Chapter 7: Economic Impact Analysis

Introduction

The proposed §316(b) New Facility Rule applies to a number of industries, but only affects a small number of facilities in each industry. EPA conducted a screening analysis to assess whether it is likely that the proposed rule will have a significant economic impact on any of the 98 projected new facilities. This chapter presents EPA's analysis of economic impacts for the affected new facilities. Later chapters consider impacts on small entities (Chapter 8) and on governments (Chapter 9) as special cases.

The economic impact analysis is conducted at the facility-level. EPA would be concerned about potential firm- and industry-level impacts only if facility-level results indicated the potential for significant impacts or if one firm owned multiple facilities. The facility-level analysis showed that eight of the 98 projected new facilities would have annual compliance costs of more than one percent of revenues. Only one of these eight facilities is expected to have a cost-to-revenue ratio of more than five percent. EPA therefore concludes that compliance with this regulation is both economically practicable and achievable at the facility-, firm-, and national levels.

The remainder of this chapter is organized as follows:

- Section 7.1 discusses the methodology used to assess economic impacts for the 40 new electric generators, including the data sources and approach for estimating the economic characteristics of the regulated facilities, the specific economic impact measures used, and the results of the analysis.
- Section 7.2 presents the economic impact analysis for the 58 new manufacturing facilities. This section discusses the same information as Section 7.1 for electric generators.
- Section 7.3 provides a summary of the economic impact analysis at the facility-level.
- Section 7.4 discusses the potential for firm- and industry-level impacts as a result of the proposed §316(b) New Facility Rule.
- The final Section 7.5 presents the impact analysis for the eight case study facilities for which costs were developed in *Chapter 6: Facility Compliance Costs*.

Chapter Contents

7.1 New Steam Electric Generators

EPA projected that 40 new steam electric generators in scope of the proposed §316(b) New Facility Rule will begin commercial operation within the next 20 years (see *Chapter 5: Baseline Projections of New Facilities*). Seven of the 40 facilities are "real" facilities identified from a database of planned new electric generation facilities (the NEWGen database; RDI, 2000). For these facilities, some actual data on capacity, location, and technical characteristics were available. The remaining 33 facilities are projected facilities that are estimated to begin operation between 2004 and 2010. These are hypothetical, or "extrapolated," facilities for which no actual information is available.

EPA used the following measures to assess economic impacts for new electric generators:

- annualized compliance costs as a percent of expected annual revenues; and

- initial compliance costs as a percent of plant construction cost.[1]

7.1.1 Economic Characteristics

Calculating the two economic impact measures requires the following information for each new in-scope steam electric generator:

- total annualized compliance cost,
- expected annual revenues,
- initial compliance cost, and
- construction cost of the plant.

Chapter 6: Facility Compliance Costs summarized the methodology and results of EPA's cost estimation. The remainder of this section will therefore focus on the estimation of revenues and the total cost of the plant.

a. Expected Annual Revenues

EPA estimated expected annual revenues by making assumptions about future electricity sales for each facility. This calculation used the following formula:

$$Rev_x = GenCap_x * ESF_y * Price_y$$

where:

Rev_x	=	Annual revenues of facility x
$GenCap_x$	=	Generation capacity of facility x (in MW)
ESF_y	=	Projected electricity sales factor in NERC region y (in MWh/MW)
$Price_y$	=	Projected electricity price in NERC region y (in $1999)

Each component of this calculation is further explained below.

❖ *Generating capacity*

The NEWGen database provided information on the planned capacity (in MW) of the seven electric generators found to be in scope of this regulation. Total planned capacity for the seven facilities ranges between 475 MW and 1,100 MW. The generating capacity of the six extrapolated generators projected to begin operation between 2004 and 2009 is assumed to be equal to the average capacity for the seven NEWGen facilities, or 672 MW each. The capacities for the 16 coal and 11 combined-cycle plants expected to begin operation between 2011 and 2020 are assumed to be 800 MW and 723 MW, respectively.[2]

❖ *Electricity sales factor*

EPA estimated the average amount of electricity sold per MW of generating capacity for each NERC region using forecasts from the Energy Information Administration's (EIA) *Annual Energy Outlook 2000* (DOE, 1999a). The calculation was made by dividing the NERC region's projected annual electricity sales between 2001 and 2010 by the region's projected capacity over the same time period, using the following formula:

$$ESF_y = \frac{\sum_{t=2001}^{2010} Electricity\ Sold_y}{\sum_{t=2001}^{2010} GenCap_y}$$

where:

ESF_y	=	Projected electricity sales factor in NERC region y
Electricity $Sold_y$	=	Projected annual electricity sales in NERC region y (in MWh)
$GenCap_y$	=	Projected annual generating capacity in NERC region y (in MW)
t	=	Year of forecast (from 2001 to 2010)

Table 7-1 presents the calculated average electricity sales per MW of capacity for each NERC region and the U.S. average.

[1] Initial compliance costs include the compliance costs of the proposed §316(b) New Facility Rule that will be incurred before a new facility can begin operation. These are capital technology costs and initial permit application costs.

[2] The combined-cycle plants' capacity is the average of the 56 analyzed NEWGen facilities. Fifty-five of these 56 facilities are combined-cycle facilities.

Table 7-1: Estimated Average Electricity Sales Factors by NERC Region

NERC Region	Projected Electricity Sales per (2001 - 2010) in MWh/MW
ECAR – East Central Area Reliability Coordination Agreement	5,230
ERCOT – Electric Reliability Council of Texas	4,351
FRCC – Florida Reliability Coordinating Council	4,079
MAAC – Mid-Atlantic Area Council	4,427
MAIN – Mid-America Interconnected Network	4,225
MAPP – Mid-Continent Area Power Pool	4,882
NPCC/NE – Northeast Power Coordinating Council/New England	4,140
NPCC/NY – Northeast Power Coordinating Council/New York	3,644
SERC – Southeastern Electric Reliability Council/Excl. Florida	5,139
SPP – Southwest Power Pool	4,119
WSCC/CNV – Western Systems Coordinating Council/California-Southern Nevada Power	3,304
WSCC/NWP – Western Systems Coordinating Council/N.W. Power Pool Area	5,157
WSCC/RMPA – Western Systems Coordinating Council/Rocky Mountain Power Area & Arizona	5,116
U.S. Average	4,575

Source: U.S. DOE, 1999a.

EPA applied the NERC region-specific average sales per MW of capacity to the seven NEWGen facilities to calculate total annual electricity sales (in MWh). The national average was used for the 33 extrapolated facilities that do not have a known NERC region.

The actual amount of electricity that is generated and sold by a facility depends on how often the facility's units are dispatched. Using the calculated average factors may therefore over- or underestimate actual facility sales. The factors would *overestimate* electricity sales, and therefore estimated revenues, if the 40 electric generators were dispatched *less* than the average facility; they would *underestimate* sales and revenues if the 40 facilities were dispatched *more* than the average.

Dispatch frequencies are often correlated with the type of prime mover used at the facility.[3] Estimating the sales per MW of capacity by prime mover would require information on both sales and capacity by prime mover type. Published electricity generation and sales estimates are only available by fuel type and not by prime mover, however, while capacity is only available by prime mover.

EPA believes that using the calculated average factors by NERC region will generally provide a robust estimate of plant-level generation and sales, and therefore impacts, for the projected new facilities. Twenty-four of the 40 facilities are expected to be combined-cycle facilities, which are primarily designed to supply peak and intermediate capacity but can also be used to meet baseload requirements (U.S. DOE, 1999a, p. 65), and are therefore likely to have dispatch frequencies close to the average for all facilities.

[3] For example, gas turbines are generally peaking units that are dispatched less frequently than the average facility while coal or nuclear plants are generally baseload units that are dispatched more frequently than the average.

The estimated average factor may underestimate generation and sales for the projected 16 coal plants because these are relatively large facilities that can be expected to operated as baseload units. Using the average electricity sales factor may therefore understate revenues relative to compliance costs and would provide a conservative estimate of economic impacts for these facilities.

❖ *Electricity price*

The final component needed to calculate annual revenues is the price of electricity. EPA used a regional price of generation, excluding transmission and distribution charges, forecasted by the U.S. Department of Energy's *Policy Office Electricity Modeling System* (POEMS). The generation price reflects the amount of revenue plants are likely to receive in a deregulated electricity market in which transmission and distribution services are separated from the generation function. POEMS forecasts electricity prices for several years into the future under a reference case and a competitive case. For this analysis, EPA considered the forecasted prices under the competitive case for 2000 and 2005. To provide a conservative estimate of revenues, EPA used the lower of the reported prices in each NERC region (U.S. DOE, 1999b).[4]

Table 7-2 presents the forecasted electricity prices per MWh for each NERC region and the U.S. average.[5]

[4] EPA also considered using the EIA's *National Energy Modeling System* (NEMS) forecasts, but the available NEMS results do not distinguish the price of generation from the distribution and transmission charges.

[5] Prices were adjusted from 1998 to 1999 dollars using the electric power Producer Price Index (PPI).

Table 7-2: Minimum Forecasted Electricity Prices by NERC Region

NERC Region	Electricity Price (Minimum of 2000 and 2005) in $/MWh
ECAR – East Central Area Reliability Coordination Agreement	21.0
ERCOT – Electric Reliability Council of Texas	29.7
FRCC – Florida Reliability Coordinating Council	30.7
MAAC – Mid-Atlantic Area Council	29.7
MAIN – Mid-America Interconnected Network	23.5
MAPP – Mid-Continent Area Power Pool	17.1
NPCC/NE – Northeast Power Coordinating Council/New England	34.3
NPCC/NY – Northeast Power Coordinating Council/New York	31.3
SERC – Southeastern Electric Reliability Council/Excl. Florida	24.9
SPP – Southwest Power Pool	24.7
WSCC – Western Systems Coordinating Council	27.2
U.S. Average	26.7

Source: U.S. DOE, 1999b.

EPA applied the NERC region-specific electricity prices to the projected electricity sales (in MWh) of the seven NEWGen facilities to calculate total annual revenues. The national average was used for the 33 extrapolated facilities that do not have a known NERC region. Projected annual facility revenues range from approximately $54 million to $109 million, or from $99,000 to $142,000 per MW of generating capacity.

b. Plant Construction Costs

EPA used two data sources to estimate the total construction cost of the new electric generating facilities. The NEWGen database contains "Total Plant Cost" among its data on facility financing. This information is available for most but not all facilities in the database.[6] According to RDI, however, these data may not provide a good basis for analysis because of uncertainty about which specific cost components are included by facilities when reporting this plant cost. EPA therefore used a second source, the *Assumptions to the Annual Energy Outlook 2000* (U.S. DOE, 2000), to estimate plant construction cost. Table 37 of the *Assumptions* presents the cost and performance characteristics of new generating technologies assumed in EIA's electricity forecasts. The following technology-specific overnight capital costs were used in the analysis:[7]

- Advanced Gas/Oil Combined Cycle $594/kW
- Scrubbed Coal New $1,128/kW
- Advanced Nuclear $2,447/kW

Overnight capital costs are the base costs estimated to build a plant in a hypothetical *Middletown, USA*. Regional multipliers for new construction, reported in Table 38 of the *Assumptions*, were applied to these base costs to account for construction cost differences between the various NERC regions.[8]

EPA used the smaller plant cost of the two data sources to

[6] EPA supplemented missing plant costs with information from permit applications and facility websites, where available.

[7] Overnight capital costs were adjusted from 1998 to 1999 dollars using the Engineering News-Record Construction Cost Index. The analysis of the 44 new electric generators presented in this section used the overnight capital costs for advanced gas/oil combined cycle and scrubbed new coal facilities. The costs for scrubbed new coal and advanced nuclear were used in the analysis of worst case electric generator impacts in Section 7.5.

[8] The regional multipliers used in this analysis are calculated as the average of reported multipliers for factory equipment, site labor, and site material.

estimate the ratio of initial compliance costs to plant construction costs. This approach provides a conservative measure of potential economic impacts on new electric generators.

Table 7-3 presents EPA's estimates of the economic and financial characteristics of the 40 new in scope electric generators.

Table 7-3: Economic and Financial Characteristics of New In Scope Electric Generators ($1999 thousands)

Facility Name	No. of Facilities	NERC Region	Planned Capacity (MW)	Electricity Sales Factor	Annual Electricity Sales (MWh)	Price ($/MWh)	Expected Annual Revenues	Plant Construction Cost	
								RDI	EIA
GenA	1	NPCC/NE	750	4,140	3,104,815	34.3	$106,639	$300,000	$519,502
GenB	1	MAIN	1,100	4,225	4,647,151	23.5	$109,137	n/a	$661,796
GenC	1	ERCOT	510	4,351	2,218,769	29.7	$66,002	$170,000	$291,693
GenD	1	NPCC/NE	525	4,140	2,173,371	34.3	$74,647	$175,000	$363,651
GenE	1	NPCC/NY	475	3,644	1,730,765	31.3	$54,195	$680,000	n/a
GenF	1	NPCC/NE	544	4,140	2,252,026	34.3	$77,349	$340,000	$376,812
GenG	1	SERC	800	5,139	4,111,273	24.9	$102,184	$397,000	$406,894
Gen1 - Gen6[†]	6	n/a	672	4,575	3,074,119	26.7	$82,226	$343,667	$436,724
Coal1, 9, 13	3	n/a	800	4,575	3,659,665	26.7	$97,888	n/a	$902,449
Coal2-4, 6-8, 10-12, 14-16	12	n/a	800	4,575	3,659,665	26.7	$97,888	n/a	$902,449
Coal5	1	n/a	800	4,575	3,659,665	26.7	$97,888	n/a	$902,449
CC1, 5, 9	3	n/a	723	4,575	3,307,422	26.7	$88,467	n/a	$429,257
CC2-4, 6-8, 10-11	8	n/a	723	4,575	3,307,422	26.7	$88,467	n/a	$429,257

[†] Gen1 through Gen6 are the six extrapolated facilities. Their characteristics represent the national average for the electricity sales factor and the electricity price, and the average of the seven NewGen facilities for capacity and plant construction cost.

Source: Analysis based on RDI, 2000; U.S. DOE, 1999a; U.S. DOE, 1999b.

7.1.2 Economic Impact Analysis Results

EPA used two economic impact measures for the 40 new electric generators: (1) the ratio of total annualized compliance cost to estimated revenues ("cost-to-revenue ratio") and (2) the ratio of initial compliance costs to the construction cost of the plant ("initial cost-to-plant construction cost ratio"). Estimating these ratios required discounting costs that occur in the future. For the cost-to-revenue ratio, EPA first calculated the present value of the streams of compliance costs over the first 30 years of each plant's life.[9] The present value was then annualized over 30 years to derive the constant annual value of the stream of

[9] The impact analysis presented in this chapter considers the first 30 years *of each facility's life*. This is different from the total cost estimate presented in Chapter 6 which only considered costs over the first 30 years *of the rule*, i.e., 2001 to 2030. EPA believes that including 30 years of compliance costs for each facility is a better indicator of potential facility-level impact than limiting costs to the first 30 years of the rule.

future compliance costs, using a seven percent discount rate (see formulas in *Chapter 6: Facility Compliance Costs*, Section 6.3).

Estimation of the initial cost-to-plant construction cost ratio involved dividing initial compliance costs, including capital technology and initial permit application costs, by the smaller of the two plant construction cost values.

Table 7-4 presents the results of the economic impact analysis for the 40 new electric generators. The table shows that the cost-to-revenue ratio for the new electric generators ranges between 0.07 and 4.16 percent. The initial cost-to-plant cost ratio ranges between 0.01 and 1.48 percent. Based on the low values of these impact measures, EPA believes that the economic impacts of the proposed §316(b) New Facility Rule on new electric generators will be minimal.

Table 7-4: Economic Impacts for New Electric Generators

Facility Name	No. of Facilities	Total Annualized Compl. Cost	Expected Annualized Revenues	Total Annualized Compl. Cost/ Expected Annualized Revenues	Net Present Value of Initial Compl. Cost†	Minimum Plant Construction Cost	NPV of Initial Compl. Cost/ Minimum Plant Construction Cost
GenA	1	$72,638	$106,638,872	**0.07%**	$44,491	$300,000,000	**0.01%**
GenB	1	$73,147	$109,136,681	**0.07%**	$47,004	$662,000,000	**0.01%**
GenC	1	$84,742	$66,002,195	**0.13%**	$246,526	$170,000,000	**0.15%**
GenD	1	$84,794	$74,647,211	**0.11%**	$49,889	$175,000,000	**0.03%**
GenE	1	$79,448	$54,195,202	**0.15%**	$49,120	$680,000,000	**0.01%**
GenF	1	$77,508	$77,348,729	**0.10%**	$44,936	$340,000,000	**0.01%**
GenG	1	$90,850	$102,183,962	**0.09%**	$190,617	$397,000,000	**0.05%**
Gen1-6	6	$78,987	$82,226,151	**0.10%**	$95,910	$344,000,000	**0.03%**
Coal1, 9, 13	3	$4,070,476	$97,888,275	**4.16%**	$13,348,971	$902,000,000	**1.48%**
Coal2-4, 6-8, 10-12, 14-16	12	$86,696	$97,888,275	**0.09%**	$77,943	$902,000,000	**0.01%**
Coal5	1	$450,210	$97,888,275	**0.46%**	$4,729,791	$902,000,000	**0.52%**
CC1, 5, 9	3	$889,074	$88,466,529	**1.01%**	$2,617,030	$429,000,000	**0.61%**
CC2-4, 6-8, 10-11	8	$90,850	$88,466,529	**0.10%**	$190,617	$429,000,000	**0.04%**

† Initial compliance cost includes the one-time costs presented in Table 6-11, i.e., capital and initial permit application costs.

Source: EPA Analysis, 2000.

7.2 New Manufacturing Facilities

EPA projected that 58 new manufacturing facilities in scope of the proposed §316(b) New Facility Rule will begin commercial operation within the next 20 years (see *Chapter 5: Baseline Projections of New Facilities*). Forty-eight of the 58 facilities are chemical facilities and ten are primary metals facilities. All 58 facilities are hypothetical facilities for which no actual information on capacity, location, technical, or economic characteristics are available.

EPA used annualized compliance costs as a percent of expected annual revenues ("cost-to-revenue ratio") as a

measure of economic impacts. The comparison of initial compliance costs to plant construction costs used for electric generators could not be estimated for manufacturing facilities because information on facility construction cost is not readily available for the manufacturing SIC codes of interest.

7.2.1 Economic Characteristics

Estimation of the cost-to-revenue ratio requires the following information for each new in scope manufacturing facility:

- total annualized compliance cost, and
- expected annual revenues.

EPA estimated facility-level employment and revenues and firm-level employment for the 29 projected facilities expected to begin operation between 2001 and 2010, using information for existing facilities in the relevant industries.[10] The Agency used results from the §316(b) *Industry Screener Questionnaire: Phase I Cooling Water Intake Structures* (January 1999) to project employment and revenues, using the following methodology:

- ***Identify existing facilities from the Screener Questionnaire that serve as "model facilities" for the proposed new facilities:*** EPA analyzed screener respondents in each 4-digit SIC code that has at least one projected new facility. Only those screener respondents that meet the "in scope" characteristics of the proposed §316(b) New Facility Rule were used as model facilities.[11]

- ***Assign economic characteristics to each new in scope facility:*** EPA grouped the screener model facilities by SIC code and sorted them by their reported facility employment. EPA then selected one screener model facility to represent the economic characteristics of the projected new facility. Where only one new in scope facility is projected in an SIC code, the screener facility with the median facility employment served as the representative facility. In SIC codes where EPA projects more than one new in scope facility, all screener model facilities in that SIC code were evenly divided into as many groups as there are projected new facilities. The model facility with the median facility employment in each group served as the representative facility.[12] EPA assumed that the facility- and firm-level employment and revenues of the projected new facilities is the same as the facility- and firm-level employment and revenues of these representative screener facilities.

- ***Supplement missing data, where necessary:*** Some of the representative facilities identified among the screener model facilities did not report facility revenues or firm employment in the screener questionnaire. The missing information for these facilities was supplemented by data from the 1992 Census of Manufactures and the Dun and Bradstreet (D&B) database. EPA supplemented missing facility revenues by using average facility-level revenues by employment size category from the Census of Manufactures.[13] EPA supplemented missing firm-level information by identifying the DUNS numbers of the firms owning the screener model facilities and by retrieving each firm's employment data from the D&B database.

Table 7-5 presents the economic characteristics of the projected new in scope facilities using model facilities developed from the Industry Screener database and supplemented with facility revenue data from the Bureau of the Census and the D&B database.

[10] This section only presents information for the 29 facilities expected to begin operation in the first ten years of the rule. The characteristics, both revenues and compliance costs, of the 29 facilities projected to begin operation in the second ten years are assumed to be identical to the first 29 facilities. Facilities beginning operation between 2011 and 2020 would therefore experience the same impacts as the 29 facilities discussed in this section.

[11] Screener respondents that meet the in scope characteristics of the proposed §316(b) New Facility Rule (1) operate a CWIS; (2) hold an NPDES permit;(3) have a design intake flow of greater than two million gallons per day (MGD); and (4) use at least 25 percent of the water withdrawn for cooling purposes. Information on the percentage of intake water for cooling purposes was not available for all screener respondents. Where this information was unavailable, EPA assumed that the facility would meet this criterion.

[12] For example, an SIC code may have 45 screener model facilities and three projected in scope facilities. The 45 screener model facilities would be sorted in ascending order by their facility employment and divided into three groups of 15 facilities each. The first group would contain the 15 facilities with the fewest employees; the second group would contain the 15 facilities with middle employment levels; the third group would contain the 15 facilities with the most employees. Within each group, EPA assigned the median employment level of the model facilities to the new facility. The median facilities in this case are the facilities that rank eighth, 23rd, and 38th in employment.

[13] For example, a projected new facility in SIC code 2824 with an employment level of 1,200 employees would be assigned average facility revenues reported in the Census for the employment size category from 1,000 to 2,499 employees.

Table 7-5: Projected Economic Characteristics of New Manufacturing Facilities (2001 to 2010) (Revenues in $1999 thousands)

Facility ID	SIC	SIC Description	Number of New Facilities	Facility FTEs	Facility Annual Revenue†	Firm FTEs
Chemical and Allied Product Facilities (SIC 28)						
new 2812-1	2812	Alkalies and Chlorine	1	650	$125,271	12,380
new 2813-1	2813	Industrial Gases	1	18	$24,951	25,388
new 2819-1	2819	Industrial Inorganic Chemicals, N.E.C.	2	75	$26,345	81,600
new 2819-2				140	$94,502	5,500
new 2821-1	2821	Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers	3	567	$113,521	10,500
new 2821-2				1,000	$455,816	70,400
new 2821-3				1,610	$1,142,768	290,000
new 2824-1	2824	Manmade Organic Fibers, Except Cellulosic	1	1,446	$472,593	98,000
new 2833-1	2833	Medicinal Chemicals and Botanical Products	1	600	$605,178	53,800
new 2834-1	2834	Pharmaceutical Preparations	1	273	$228,029	40,000
new 2841-1	2841	Soaps and Other Detergents, Except Speciality Cleaners	1	460	$283,962	26,946
new 2865-1	2865	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments	1	139	$874,267	39,362
new 2869-1	2869	Industrial Organic Chemicals, N.E.C.	9	170	$68,898	17,000
new 2869-2				200	$97,698	17,000
new 2869-3				200	$107,064	98,000
new 2869-4				240	$67,566	260
new 2869-5				452	$334,647	39,362
new 2869-6				1,160	$615,280	98,000
new 2869-7				1,290	$1,214,590	13,300
new 2869-8				1,290	$1,214,590	13,300
new 2869-9				1,780	$1,214,590	15,000
new 2873-1	2873	Nitrogenous Fertilizers	1	170	$46,543	8,390
new 2874-1	2874	Phosphatic Fertilizers	1	350	$268,721	9,000
new 2899-1	2899	Chemicals and Chemical Preparations, NEC	1	135	$30,360	135

Table 7-5: Projected Economic Characteristics of New Manufacturing Facilities (2001 to 2010) (Revenues in $1999 thousands)

Facility ID	SIC	SIC Description	Number of New Facilities	Facility FTEs	Facility Annual Revenue†	Firm FTEs
Primary Metals Industries (SIC 33)						
new 3312-1	3312	Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills	3	260	$5,828	14,880
new 3312-2				1,000	$225,286	41,620
new 3312-3				5,000	$1,503,693	16,400
new 3316-1	3316	Cold-Rolled Steel Sheet, Strip, and Bars	1	240	$28,871	4,580
new 3353-1	3353	Aluminum Sheet, Plate, and Foil	1	690	$404,434	690

† Facility revenues from the screener were updated from 1997 to 1999 using Producer Price Indexes (PPI) compiled at the four-digit SIC level; revenues from the Census of Manufacturers were updated from 1992 to 1999 using the PPIs.

†† Facility annual revenues are based on Census data for the employment range from 100 to 249 employees.

Source: §316(b) Industry Screener Questionnaire, 1999; Bureau of the Census, 1992; D&B, 1999.

7.2.2 Economic Impact Analysis Results

EPA used the ratio of total annualized compliance cost to estimated revenues ("cost-to-revenue ratio") to determine facility-level impacts from the proposed §316(b) New Facility Rule. Estimating this ratio required discounting compliance costs that occur in the future. EPA first calculated the present value of the stream of costs over the first 30 years of each facility's life.[14] This present value was then annualized over 30 years to derive the constant annual value of the stream of future costs. This calculation used a seven percent discount rate (see formulas in *Chapter 6: Facility Compliance Costs*, Section 6.3).

Table 7-6 presents the results of the economic impact analysis for the 29 new manufacturing facilities projected to begin operation between 2001 and 2010. The table shows that the cost-to-revenue ratio for the 29 facilities ranges between 0.01 percent and 8.75 percent. Only two facilities are expected to have a cost-to-revenue ratio of greater than one percent, and only one facility is expected to have a ratio of greater than three percent. Based on the low values of this impact measure, EPA believes that the economic impacts of the proposed §316(b) New Facility Rule on new manufacturing facilities will be minimal.

[14] The impact analysis presented in this chapter considers the first 30 years *of each facility's life*. This is different from the total cost estimate presented in Chapter 6 which only considered costs over the first 30 years *of the rule*, i.e., 2001 to 2030. EPA believes that including 30 years of compliance costs for each facility is a better indicator of potential facility-level impact than limiting costs to the first 30 years of the rule.

Table 7-6: Economic Impacts for New Manufacturing Facilities			
Facility ID	**Total Annualized Compl. Cost**	**Expected Annual Revenues**	**Total Annualized Compl. Cost/ Expected Annualized Revenues**
Chemical and Allied Product Facilities (SIC 28)			
new 2812-1	$79,860	$125,270,979	**0.06%**
new 2813-1	$604,465	$24,951,488	**2.42%**
new 2819-1	$100,678	$26,345,174	**0.38%**
new 2819-2	$494,390	$94,502,418	**0.52%**
new 2821-1	$84,604	$113,521,036	**0.07%**
new 2821-2	$92,936	$455,815,465	**0.02%**
new 2821-3	$82,246	$1,142,767,830	**0.01%**
new 2824-1	$79,448	$472,593,447	**0.02%**
new 2833-1	$72,638	$605,177,537	**0.01%**
new 2834-1	$126,025	$228,029,293	**0.06%**
new 2841-1	$115,784	$283,961,823	**0.04%**
new 2865-1	$72,638	$874,267,070	**0.01%**
new 2869-1	$179,504	$68,897,959	**0.26%**
new 2869-2	$179,504	$97,698,290	**0.18%**
new 2869-3	$74,626	$107,063,884	**0.07%**
new 2869-4	$74,626	$67,565,540	**0.11%**
new 2869-5	$74,626	$334,647,230	**0.02%**
new 2869-6	$100,793	$615,279,734	**0.02%**
new 2869-7	$524,504	$1,214,590,376	**0.04%**
new 2869-8	$524,504	$1,214,590,376	**0.04%**
new 2869-9	$79,448	$1,214,590,376	**0.01%**
new 2873-1	$90,347	$46,543,017	**0.19%**
new 2874-1	$76,245	$268,721,097	**0.03%**
new 2899-1	$94,879	$30,360,360	**0.31%**
Primary Metals Industries (SIC 33)			
new 3312-1	$509,697	$5,827,925	**8.75%**
new 3312-2	$74,626	$225,285,745	**0.03%**
new 3312-3	$121,090	$1,503,693,468	**0.01%**
new 3316-1	$74,250	$28,870,812	**0.26%**
new 3353-1	$73,359	$404,433,726	**0.02%**

Source: EPA Analysis, 2000.

7.3 Summary of Facility-Level Impacts

The economic impact analysis for the proposed §316(b) New Facility Rule shows that the requirements of this regulation would have minimal impacts on projected new electric generators and manufacturing facilities. Of the 98 projected facilities, only eight facilities are expected to incur annualized costs greater than one percent of revenues. Initial compliance costs compared to the plant construction cost are also expected to be small for electric generators. Table 7-7 summarizes the results of the impact analysis by industry sector.

Table 7-7: Compliance Costs and Economic Impacts by Sector

Sector	Number of Projected New In Scope Facilities	Total Annualized Compliance Costs ($mill 1999)†	Total Annualized Compl. Cost/ Annual Revenues		NPV of Initial Compl. Cost/ Plant Construction Cost	
			Lowest	Highest	Lowest	Highest
SIC 49 Steam Electric Generating	40	$18.1	0.07%	4.2%	0.01%	1.48%
SIC 26 Pulp & Paper	0	$0.0	n/a	n/a		
SIC 28 Chemicals	48	$8.2	0.01%	2.4%		
SIC 29 Petroleum	0	$0.0	n/a	n/a		
SIC 331 Steel	8	$1.6	0.01%	8.75%		
SIC 333/335 Aluminum	2	$0.1	0.02%	0.02%		
Total	98	$28.0				

† Total Annualized costs represent the costs for the first 30 years of each facility's life. These costs therefore do not match the compliance costs for the first 30 years of this rule presented in Chapter 6.

Source: EPA Analysis, 2000.

7.4 Potential for Firm- and Industry-Level Impacts

The previous section presented EPA's estimate of facility-level impacts as a result of the proposed §316(b) New Facility Rule. Given the insignificant impacts on the facility-level, EPA did not conduct a formal impact analysis at the firm- or industry-levels. Based on the analysis presented in this chapter, EPA concludes that the proposed §316(b) New Facility Rule will not cause impacts on the firms owning the impacted facilities or on their industries, for reasons discussed in this section.

The proposed rule is expected to increase the cost of the projected new in scope facilities relative to other new facilities and to existing facilities. Annualized compliance costs as a percentage of revenues at the facility-level ranged from 0.07 to 4.2 percent for new electric generators and from 0.01 to 8.8 percent for new manufacturing facilities. Since firm revenues are always equal to or greater than facility-level revenues, the cost-to-revenue ratio at the firm-level cannot be higher than at the facility-level. In most cases, this ratio would be lower. EPA therefore concluded that significant firm-level impacts as a result of the proposed §316(b) New Facility Rule are unlikely.

A rule that substantially increases the cost of new facilities could present a barrier to new entry, and constrain capacity growth in the affected industries. Barriers to new entry result in higher product prices in the long run and can retard valuable technological innovation. EPA concluded that the proposed rule is unlikely to discourage new entry, because the compliance costs associated with the proposed rule are small compared with the expected revenues of the projected facilities. However, the rule may influence the

location, design, and choice of water sources of new facilities planning to use cooling water.

Given the small number of affected in scope facilities relative to the size of the affected industries, EPA also concluded that impacts at the industry-level are very unlikely. The maximum costs incurred in any one year represent a very small percentage of total industry revenues at the 4-digit SIC level. The rule affects too small a portion of any industry to have observable impacts at the industry level. EPA therefore does not expect any impacts on industry productivity, competition, prices, output, foreign trade, or employment. EPA concluded that a detailed market analysis is not required for any of the affected industries, given the screening analysis results.

7.5 Case Study Facility Impacts

EPA also estimated economic impacts for the eight case study facilities costed in Section 6.4 of *Chapter 6: Facility Compliance Costs*. These eight facilities include four worst case hypothetical electric generators (two large coal-fired power plants and two large nuclear plants) and four manufacturing facilities in industries in which EPA does not expect construction of new in scope facilities in the near future: SIC 20 (Food and Kindred Products), SIC 26 (Pulp and Paper), SIC 29 (Petroleum Refining), and SIC 32 (Stone, Clay, Glass and Concrete).

EPA used the same methodologies to estimate economic characteristics and impacts for the eight case study facilities as were used for the 98 projected new facilities discussed in Sections 7.1 and 7.2 above.

The following two subsections present the economic characteristics and impacts for the worst case electric generators and the case study manufacturing facilities, respectively.

a. Worst Case Electric Generators

The four worst case electric generators are hypothetical facilities with no actual economic or technical information. EPA made the following assumptions to project economic characteristics and estimate impacts:

- ***Waterbody type:*** All four plants will be located on an estuary. This assumption will result in the highest potential compliance costs because facilities drawing water from estuaries are subject to the most stringent compliance requirements under the proposed §316(b) New Facility Rule.

- ***NERC region:*** All four facilities will be located in the Southwest Power Pool (SPP) NERC region. The SPP region has the lowest electricity price of any coastal regions and one of the lowest electricity sales factors. The analysis will therefore provide a conservative estimate of projected facility revenues and is likely to overstate economic impacts.

- ***Capacity:*** The capacity of two of the four electric generators (CoalMax and NucMax) is the capacity of the facility with the maximum flow for a recirculating system among existing coal plants and nuclear plants, respectively. EPA identified these two high-flow plants from the 1995 EIA-767 database. The capacity of the two other generators (CoalAvg and NucAvg) is the average capacity of facilities with a flow among the highest third of once-through systems for existing coal plants and nuclear plants, respectively. This information is also based on the 1995 EIA-767 database.

Table 7-8 presents the assumed economic characteristics of the four worst case electric generators.

Table 7-8: Economic and Financial Characteristics of Worst Case Electric Generators ($1999 thousands)

Facility Name	NERC Region	Planned Capacity (MW)	Electricity Sales Factor	Annual Electricity Sales (MWh)	Price ($/MWh)	Estimated Annual Revenues	Plant Construction Cost	
							RDI	EIA
CoalMax	SPP	2,558	4,119	10,535,816	24.7	$260,145	n/a	$1,523,789
CoalAvg	SPP	1,200	4,119	4,942,525	24.7	$122,038	n/a	$714,834
NucMax	SPP	2,708	4,119	11,153,632	24.7	$275,400	n/a	$1,613,143
NucAvg	SPP	2,666	4,119	10,980,643	24.7	$271,129	n/a	$1,588,124

Source: Analysis based on U.S. DOE, 1999a; U.S. DOE, 1999b.

EPA applied the same measures used for the 40 projected new electric generators to assess economic impacts on the four worst case facilities:

- annualized compliance costs as a percent of expected annual revenues; and
- initial compliance costs as a percent of the construction cost of the plant.

Table 7-9 presents the economic impact results for the four worst case electric generators.

Table 7-9: Economic Impacts for Worst Case Electric Generators

Facility Name	Total Annualized Compl. Cost	Expected Annualized Revenues	Total Annualized Compl. Cost/ Expected Annualized Revenues	Net Present Value of Initial Compl. Cost†	Plant Construction Cost	NPV of Initial Compl. Cost/ Plant Construction Cost
CoalMax	$1,353,428	$260,145,006	**0.5%**	$12,444,249	$1,523,788,501	**0.8%**
CoalAvg	$6,234,675	$122,038,314	**5.1%**	$21,958,268	$714,834,324	**3.1%**
NucMax	$2,802,671	$275,399,795	**1.0%**	$26,015,277	$1,613,142,792	**1.6%**
NucAvg	$17,523,882	$271,128,454	**6.5%**	$53,714,343	$1,588,123,591	**3.4%**

† Initial compliance cost includes the one-time costs presented in Table 6-14, i.e., capital, and initial permit application costs.

Source: EPA Analysis, 2000.

Table 7-9 shows that the cost-to-revenue ratio for the four hypothetical worst case electric generators ranges between 0.5 and 6.5 percent. The initial cost-to-plant construction cost ratio ranges between 0.8 and 3.4 percent.

These results show that, if facilities with the characteristics of the four hypothetical worst case generators were being built in the future, such facilities could experience economic impacts that are higher than those estimated for the projected 40 electric generators. However, EPA believes that it is extremely unlikely that many facilities with worst case characteristics will be constructed in the future. The EIA does not project construction of any new nuclear facilities over the next 20 years.

In addition, the regulatory framework provides considerable flexibility for facilities to meet the requirements of the proposed §316(b) New Facility Rule. Facilities that are proposing to withdraw from estuaries and would as a result incur high compliance costs may choose to locate on a different type of water body and at a greater distance from biologically sensitive areas. By relocating their CWISs, facilities similar to the four worst case facilities can avoid some of the compliance requirements and would therefore face lower compliance costs and economic impacts.

EPA believes that, based on current technology and resource conservation trends, significant economic impacts on the electricity generation sector are unlikely. However, the Agency recognizes that in a few worst case instances, high flow electric generators could incur high costs to comply with the requirements of the proposed §316(b) New Facility Rule.

b. Case Study Manufacturing Facilities

The four case study manufacturing facilities are hypothetical facilities for which no actual economic or technical information exists. EPA estimated economic characteristics for these facilities using responses to the §316(b) Screener Questionnaire, as described in Section 7.2 for the 58 projected new manufacturing facilities.

Table 7-10 presents the economic characteristics of the four case study manufacturing facilities.

Table 7-10: Projected Economic Characteristics of Case Study Manufacturing Facilities (Revenues in $1999 thousands)

Facility ID	SIC	SIC Description	Facility FTEs	Facility Annual Revenue†
New SIC 20 HF	20	Food And Kindred Products	689	$1,826,719
New SIC 26 HF	26	Paper And Allied Products	331	$164,273
New SIC 29 HF	29	Petroleum Refining	570	$151,681
New SIC 32 HF	32	Stone, Clay, Glass, And Concrete Products	260	$64,581

† Facility revenues from the screener were updated from 1997 to 1999 using Producer Price Indexes (PPI) compiled at the four-digit SIC level; revenues from the Census of Manufacturers were updated from 1992 to 1999 using the PPIs.

Source: §316(b) Screener Questionnaire, 1999; Bureau of the Census, 1992.

EPA used the ratio of total annualized compliance cost to estimated revenues ("cost-to-revenue ratio") to determine facility-level impacts for the four case study manufacturing facilities.

Table 7-11 presents the economic impact results for these facilities. The table shows that the cost-to-revenue ratio for the four facilities ranges between 0.02 and 2.1 percent. The Agency therefore concludes that new manufacturing facilities in other industries are not expected to incur significant economic impacts as a result of the proposed §316(b) New Facility Rule.

Table 7-11: Economic Impacts for Case Study Manufacturing Facilities

Facility ID	Total Annualized Compl. Cost	Expected Annualized Revenues	Total Annualized Compl. Cost/ Expected Annualized Revenues
New SIC 20 HF	$333,460	$1,826,718,783	**0.02%**
New SIC 26 HF	$77,780	$164,273,163	**0.05%**
New SIC 29 HF	$84,326	$151,680,887	**0.06%**
New SIC 32 HF	$1,367,874	$64,581,082	**2.12%**

Source: EPA Analysis, 2000.

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